THE UNIVERSITY OF NOTTINGHAM

FACULTY OF APPLIED SCIENCE

Applications of Computers

SUPPLEMENT TO LECTURE 19.

"THE ORGANISATION OF A COMPUTING CENTRE"

THE ELLIOTT MATHEMATICAL, PROGRAMMING AND COMPUTING SERVICE

The service has been in operation since 1954 and is now based on a 402F computer. This is a medium size, high speed digital computer. It has a storage capacity of about 5000 words, each of 32 binary digits; the word-time is 0.1 milliseconds and most operations are completed in two word times. It has two arithmetic units, for performing fixed and floating point arithmetic, and may be switched from one to the other under programme control. Floating point operations use the same instructions, and take the same time, as the corresponding fixed point operations.

The computing service hires time on the computer to those organisations with their own programmers, and tackles problems for others (ab initio). This usually starts with a visit to discuss the problem, followed by an estimate of the charge - at £2 per hour for programming time and £25-£35 per hour for computer time. The detailed programme is then produced, checked on the machine and finally run. Once a particular programme is in regular use results may be produced very rapidly. In some cases data is received by TELEX and the results are despatched the same day. However the machine is fully occupied and unexpected requests for machine time cannot always be satisfied for several days.

The staff required to keep a computer busy depends on the kind of work for which it is used. In the case of a computing service, with a large variety of work, comparatively few routine tasks and the responsibility of expanding the library of subroutines, quite a large number of programmers are required. At the time of writing (July)

there are 10 full time programmers, one machine operator and about three part-time programmers. The machine operator runs those jobs which are of a routine nature and are used frequently, but each programmer is completely responsible for his problems, from the initial planning right through to the production runs. The most important part of this procedure are the initial discussions with the customer, for the problem must be formulated correctly before programming can begin. Conversely the programme must be written in as general a manner as possible, to allow for alterations to the original problem. Programming may take anything from a few hours, where automatic coding or interpretive schemes are suitable, to many weeks for long and complicated problems.

An analysis of machine time over one week is shown below.

		hours	percentage
Scheduled Maintenance	S	5.0	8.1
Unscheduled Maintenance	U	1.3	2.1
Programme Checking	C	25.0	40.5
Production Runs	N	29.7	48.2
Idle time	I	0.7	1.1
Total Machine Hours	T	61.7	100.0
Availability = (C + N + I)/T		=	89.8%
Efficiency = (C + N + I)/(T - S)		=	97.9%
Usage = (C + N)/(C + N + I)		=	98.8%

The week covered by this analysis was shortly after the first 402F available to the computing service was finished. A good deal of time was therefore spent on developing new programmes for the floating point part of the computer. The week is also unusual in the rather high efficiency shown. This figure is normally 90-95%.

The work carried out during this week included:-

1. Investigations into optimum design and operating conditions of a continuous multicomponent distillation column.

2. Investigations into the problem of minimising waste in the cutting of plate glass.

3. The complete design of an atomic reactor: some twenty different programmes are under development.

4. Demonstrations for those participating in a programming course, and the testing of programmes written during this course. During the period of a fortnight it is possible to cover all the details of programming the 402 machines and persons attending the course will normally have completed three or four programmes.

5. The calculation of structure factors and least squares refinement of crystal structures from data provided by X-ray diffraction experiments.

6. Multiple regression analyses.

7. The calculation of partial pressures of the components in a gas sample from Mass Spectrometer observations.